1099-162 Randomized Comparison of the Effect of Aspirin Versus Ticlopidine on the Thrombogenic Potential of Radiofrequency Ablation

A.S. Manolis, V. Vassilikos, T. Maounis, H. Melita, L. Psarros, G. Torzoglou, D.V. Cokkinos. *Onassis Cardiac Surgery Center, Athens; Patras University, Patras, Greece*

According to prior observations in our lab and as reflected by elevated plasma levels of D-dimer (DD), a product of fibrin degradation, radiofrequency ablation (RFA) lesions have a thrombogenic effect, which persists at 48 hours; pretreatment with combined aspirin and ticlopidine mitigates this thrombogenicity. Yet, the effect of either agent alone is unknown. In the present study 59 patients having RFA for various arrhythmias were randomized to pretreatment with either aspirin (n = 30) (Group I) or ticlopidine (n = 29) (Group II) for 3 days before the procedure. Plasma DD levels were measured by enzyme immunoassay before insertion of catheters, after completion of the electrophysiologic study (EPS), immediately and at 48 hours after RFA. Results were also compared with those in 31 pts (Group III), who had received pretreatment with combined aspirin and ticlopidine. At all stages DD levels were higher in groups I & II compared with group III:

DD (μg/l)	Baseline	Post-EPS/Pre-RFA	Post-RFA	48 hours
Group I (30)	31 ± 20	91 ± 100	214 ± 210	91 ± 100
Group II (29)	24 ± 13	51 ± 35	201 ± 222	85 ± 99
Group III (31)	17 ± 11	31 ± 17	74 ± 60	35 ± 31
P value	0.002	0.001	0.005	0.009

There were no differences among the groups in the number of RFA lesions or duration of procedure.

In conclusion, pre-treatment with aspirin or ticlopidine alone does not decrease the thrombogenic potential of RFA. Only combined therapy with aspirin and ticlopidine has a favorable effect as reflected by the lower degree of D-dimer elevation.

1099-163 A Novel Interval Δ(OCS-DCS) Is the Only Independent Predictor of Complete vs. Incomplete Isthmus Conduction Block in Ablation of Common Atrial Flutter

C.-F. Tsai, S.-A. Chen, C.-T. Tai, Y.-A. Ding, M.-S. Chang. *Veterans General Hospital, Taipei, Taiwan*

Background: Complete or incomplete isthmus conduction block (CB, ICB) is difficult to interpret without detailed multiple electrodes mapping along the tricuspid annulus and isthmus area. To date, a simple and powerful predictor of isthmus CB is lacking. We hypothesize that distal coronary sinus (DCS) is almost activated via CS ostium (OCS) during pacing from low right atrial posterolateral (RPL) area before linear ablation; after isthmus CB or ICB, DCS is activated via Bachmann bundle (BB) or simultaneous BB and OCS, respectively. Thus, activation sequence and interval of OCS/DCS would change.

Methods and Results: We assess the conduction interval of 1) OCS - DCS, 2) RPL - OCS and P-wave polarity change during RPL pacing in sinus rhythm before and after isthmus block.

	Δ(OCS-DCS) (msec)	Δ(RPL-OCS) (msec)	P_{II} (+)	P_{III} (+)
CB	31 ± 13*	71 ± 24*	16/16	9/16
ICB	8 ± 7	45 ± 26	15/16	3/16

Δ = difference between before and after isthmus block. P (+) = change from negative to positive polarity in terminal portion of P wave in lead II and III. * = p < 0.01, CB vs. ICB. * = p < 0.01, predictor of CB/ICB.

Conclusion: Only Δ(OCS-DCS) (cutoff value 20 msec), but neither change of isthmus conduction time nor inferior P wave polarity, could predict isthmus CB or ICB.

1099-164 Percutaneous Endocardial Mapping of Atrial Flutter Using a Multipolar Basket-shaped Catheter to Facilitate Radiofrequency Catheter Ablation of the Flutter Circuit

F.P. van Rugge, M.J. Schalij. *University Hospital Leiden, The Netherlands*

Background: Detailed endocardial mapping of activation patterns during atrial flutter is usually carried out using catheters with a limited number of electrodes. In order to localize the flutter reentry circuit rapidly and accurately, we used a novel multipolar basket shaped catheter.

Methods and Results: Eight patients with common atrial flutter were studied with a 32-bipolar basket-shaped catheter. The mapping catheter, could be successfully inserted and deployed in all patients. Bipolar recordings (30 to 500 Hz) were made during sinus rhythm, atrial pacing and atrial flutter, with adequate signals obtained from >80% of the electrode pairs. During atrial flutter, double potentials were recorded along the crista terminalis and eustachian ridge in 7 patients. Entrainment mapping at sites around the tricuspid annulus demonstrated concealed entrainment (postpacing interval minus flutter cycle length < 10 ms) in 6 patients. In all patients, the multipolar mapping recording facilitated ablation of the flutter circuit. Complete atrial mapping was performed within 30 minutes with the catheter left in situ up to 90 minutes.

Conclusion: This newly-developed multipolar basket shaped catheter enables safe, fast and accurate endocardial mapping in patients with atrial flutter to facilitate radiofrequency catheter ablation of the flutter circuit.

1099-165 Origin of Unablated Discontinuities in Linear Lesions in the Canine Atrium

D.L. Packer, S.B. Johnson. *Mayo Foundation, Rochester, Minnesota, USA*

The ablation of atrial fibrillation is complicated by the occurrence of discontinuities or "skip" regions in the requisite linear lesions. To explore the etiology of these skips, 15 dogs underwent ablation for the creation of anatomic obstacle-connecting linear lesions. The origin of any discontinuity was evaluated at necropsy and by reviewing ultrasound images generated by a 7.5 megaHz, phased-array intracardiac ultrasound imaging system. 28 linear burns were created by multielectrode or saline-filled balloon catheters, and 37 were placed using a sheath-guided, single electrode drag technique. These lines were interrupted by 27 intra-lesion discontinuities (0.4/line) measuring 6.1 ± 4.5 mm, while 25 discontinuities measuring 7.9 ± 6.2 mm occurred between the end of the lesion and the targeted anchoring site. Overall, 29/52 (57%) of all discontinuities were due to anatomic factors, while 18 (35%) were related to limitations in catheter positioning, and 4 (8%) were due to catheter or electrode failures. Anatomic ridges such as the limbus, inter-pulmonary vein folds, or unusually prominent trabeculae were responsible for 10/15 (67%) of mid lesion skips created by the drag technique and 5/12 (42%) of multielectrode discontinuities. Prominent vein or trabeculae-related depressions were responsible for 4 mid lesion and 4 anchoring discontinuities. The remaining skips were due to limitations of techniques employed. Based on this, we conclude that underlying atrial anatomy was most responsible for the discontinuities within linear lesions. This information may be useful in the design of alternative electrode arrays but also suggests that direct imaging might allow the circumnavigation of these obstacles.

1099-167 Initial Impedance Predicts Temperature During Radiofrequency Catheter Ablation

E. Nsah, R.D. Berger, L.S. Rosenthal, R. Hui, B. Ramza, P.J. Imrussinkul, J.H. Lawrence, G.F. Tomaselli, D. Kass, H. Calkins. *The John's Hopkins Medical Institutions, Baltimore, MD, USA*

Prior studies have demonstrated that electrical impedance is higher in tissue than in blood and that it is greater at stable as compared with unstable catheter positions. Based on these observations, we hypothesized that the initial impedance may predict electrode temp during catheter ablation procedures. Data from 248 applications of RF energy in 45 pts [26 accessory pathways, AP; 19 atrioventricular nodal reentrant tachycardia (AVNRT)], undergoing ablation were analyzed. Effective tissue heating (ETH) was defined as a temp within 10 degrees of target electrode temp (≥60°C).

Results: The initial impedance recorded during RF energy delivery was 113 ± 10 ohms and was higher during ablation of AP than AVNRT (116 ± 66 vs 106 ± 80 ohms, p = 0.001). Among the overall group, a significant correlation was observed between the initial impedance and electrode temp (R = 0.95, p = 0.001). After accounting for interpatient differences and ablation target, an even closer correlation was observed (AP R = 0.98, p = 0.0001; AVNRT R = 0.94, p = 0.0001). An initial impedance of ≥120 ohms was associated with positive and negative predictive values for ETH of 81% and 90% respectively during ablation of APs. An initial impedance of ≥100 ohms was associated with a positive and negative predictive value of 66% and 75% during ablation of AVNRT.

Conclusion: The results of this study suggest that monitoring the initial impedance during catheter ablation procedures may be a clinically useful tool to predict ETH, particularly if normalized for interpatient differences.

1099-168 Retrograde Fast Pathway Ablation for Atrioventricular Nodal Reentry Associated With Markedly Prolonged PR Intervals

R.J. Verdino, M.C. Burke, J.G. Kall, D.E. Kopp, D.J. Wilber. *University of Chicago Hospitals, Chicago IL, USA*

Atrioventricular nodal reentrant tachycardia (AVNRT) in pts with markedly prolonged PR intervals and no apparent antegrade fast pathway (FP) function

TUESDAY POSTER

is uncommon, but may be difficult to manage without permanent pacing. Three of 400 consecutive pts (0.8%) with AVNRT referred for catheter ablation had PR intervals >300 ms in the absence of AV nodal blocking drugs. None had evidence of spontaneous AV block, infranodal conduction disease, or symptomatic bradycardia. All failed prior trials of low dose AVN blocking drugs and/or class I antiarrhythmics. Age ranged from 58–84 yrs. At baseline (B), AH intervals were 240–345 ms. AV Wenckeback occurred at a paced CL of 600–550 ms at B, and 390–430 ms during isoproterenol (I) infusion. Dual pathway physiology was not observed at B or during I in any pt. Retrograde FP conduction was present in all pts; VA Wenckebach occurred at paced CL of 700–580 at B, and 340–380 ms during I. Typical AVNRT was induced in each pt only during I (380, 420, 470 ms) with HA intervals of 133, 90 and 45 ms respectively. The atrial exit of the retrograde FP was targeted for ablation. VA block was produced in each pt without significant alteration in AH interval or paced AV Wenckebach CL. During follow-up of 8, 12 and 20 months, all pts remained asymptomatic, without recurrent AVNRT, AV block or symptomatic bradycardia. At last follow-up, the PR interval was unchanged for preablation values.

Conclusions: In pts with recurrent AVNRT and markedly prolonged PR intervals, selective ablation of the retrograde FP can eliminate AVNRT without resulting in further impairment of antegrade AVN function. In such pts without preexisting indication for pacing, retrograde FP ablation may be considered an effective alternative which defers or eliminates the need for subsequent permanent pacing.

1099-169 Multi-electrode Stretching Catheter for Creation of Linear Radiofrequency Lesions in the Atrium: Comparison With Standard Multi-electrode Design and Dragging Approach

A. Natale, S. Beheiry, H. Barold, G. Tomassoni, L. Lein, E. Dixon-Tullaoch, D. Jensen, J. Geiser, P. Wolf. *University of Kentucky, Lexington, KY; Duke University, Durham, NC; Medtronic/Cardiorhythms, Sunnyvale, CA, USA*

Radiofrequency (RF) ablation techniques for atrial fibrillation require the creation of long linear lesions in an attempt to compartmentalize the atria. We compare linear lesions with 1) a multi-electrode catheter designed to stretch the atrial wall (A. Stretch), 2) a standard multi-electrode catheter (Standard), 3) and the dragging technique. Catheter performance was assessed in 16 adult ovines. Lesions with the multi-electrode catheters were made by delivering RF energy for 60 sec at 70°C through each coil. Pacing thresholds were tested at each coil before and after each lesion. Drag lesions were made with a 4–6 mm tip catheter and retraced at least twice. The table shows the total lesion length (mm), the longest continuous lesion (mm) and the mean fluoroscopy time (minutes).

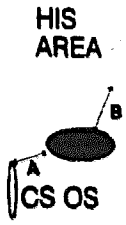
	A Stretch	Standard	Dragging
Total Length	45.1 ± 21.9	26.5 ± 6.1	32.8 ± 12.4
Longest Continuous	30 ± 15.3	19 ± 8	30 ± 14
Fluoroscopy Time	2.9 ± 1.1	7.0 ± 3	17.2 ± 4

For lesions in trabeculated regions the average number of electrodes with good pacing threshold was nine with the atrial stretch and four with the standard multi-electrode catheter. The atrial stretch catheter makes significantly longer lesions with shorter fluoroscopy time. This design allows the catheter to conform better to the anatomy of the atria and may also flatten the irregular endocardial surface improving electrode contact.

1099-170 Mapping of Koch's Triangle and Slow Pathway Ablation Guided by Nonfluoroscopic Electroanatomical Imaging

P.A. Cooke, C.T. Johnson, A.C. Lin, D.E. Kopp, M.C. Burke, R. Verdino, J.G. Kall, D.J. Wilber. *University of Chicago, Chicago, IL, USA*

We used a novel magnetic catheter tracking system with precise spatial localization (Biosense) to map Koch's triangle and direct slow pathway ablation in 10 pts with typical atrioventricular nodal reentry (AVNRT). Mapping and ablation were performed in sinus rhythm. The area over which His potentials were recorded was tagged, as were the borders of the coronary sinus (CS) os. The area of Koch's triangle was 3.33 ± 1.23 cm^2, range 1.76–5.58 cm^2, and correlated with right atrial volume (mean 59 ± 15 ml, r = 0.89, p = 0.002). The mean CS os diameter was 10 ± 2 mm, and the mean recordable His area was 0.71 ± 0.25 cm^2. Radiofrequency applications (RFA) were directed to a circumscribed area (black oval) anterosuperior to the roof of the CS in the right lateral projection. A median of 2 RFA produced junctional rhythm and eliminated previously inducible AVNRT in each pt. The successful RFA was 13 ± 6 mm anterosuperior to the roof of the CS os (A), and 15 ± 2 mm below the most inferior His (B).



Conclusions: Electroanatomical imaging facilitates identification and visualization of spatial relationships within Koch's triangle. In this preliminary study, the constancy of successful RFA sites in relation to fixed landmarks despite a broad range of atrial dimensions suggests a potential role for this mapping technique in the treatment of AVNRT.

1099-171 Valve Function Abnormalities After Radiofrequency Catheter Ablation of Left Atrioventricular Accessory Pathway: Long-term Follow-up

F.E.S. Cruz F, L. Belem, S.H. Boghossian, M. Fagundes, A. Rabischoffsky, J.C. Ribeiro, L. Vanheusden, C. Perez, R. Sa, A.I. Costa, I.G. Maia. *Hospital Pro-Cardiaco, Hospital Laranjeiras, Rio de Janeiro, Brazil*

Background: A systematic long-term Doppler-echocardiographic (DPE) evaluation on valve function in patients with left-sided accessory pathways (AP) submitted to radiofrequency ablation (RFA) is not available.

Methods: Color Doppler-echocardiograms to grade aortic (AOR) and mitral regurgitation (MR) were prospectively obtained from two hundred patients submitted to RFA, from August 1992 to August 1995. RFA procedure was performed with the retrograde aortic approach when the ablation catheter is placed beneath the mitral valve leaflet on the ventricular aspect of the annulus. AOR and MR were classified using 3 grades of severity. DP were obtained before 2 weeks, 6, 12 and 24 months after RFA procedure.

Results: One operator performed two hundred twenty-two procedures to ablate 206 accessory pathways. They were divided in 3 groups.

One hundred and eighty-four, 10 and 6 patients were submitted to 1, 2 and 3 procedures respectively and valve R developed in 8 pts. After a mean follow-up of 32 ± 10 months, no new valve abnormality was detected.

Groups	1	2	3
Number (n) RFA procedures	1-50	51-100	101-222
Mean n of RF applications	12 ± 6	9 ± 8	5 ± 4
Procedure Duration (min)	160	130	120
Mitral Regurgitation (n pts)	5	1*	0
Aortic Regurgitation (n pts)	1	0	0
MR + AOR (n pts)	1	0	0
Valve Surgery required	0	1	0

*Pt had severe MR because of papillary muscle rupture in the third day after the procedure needing surgical intervention.

The development of AOR and MR was related to the number and time of procedures and independent of number of applications or AP location.

Conclusions: 1) The occurrence of valvar abnormalities was related to operator learning curve experience. 2) Long-term follow up fails to demonstrate increase in valvar regurgitation.

1099-172 Epicardial Localization of Ventricular Outflow Tract Tachycardias

J. Hebe, A. Cumis, F. Ouyang, M. Volkmer, K.H. Kuck. *St. Georg Hospital, Hamburg, Germany*

A total of 42 pts underwent electrophysiologic testing and attempt for intervention for initial (ECG-) diagnosis of an arrhythmia generating from the right ventricular outflow tract (RVOT). In 22 of these pts the underlying arrhythmogenic substrate (AS) was localized and sequentially ablated with the use of radiofrequency current (RFC) from within the endocardial aspect of the RVOT. The left ventricular outflow tract (LVOT) was additionally studied in 3 of the remaining pts and as a consequence of failing AS-localization in both cardiac chambers an epicardial, transvenous mapping of RVOT and LVOT was performed in 2 of them. For this purpose a 2 French multipolar mapping catheter was introduced along the coronary venous route into the anterior region between RVOT and LVOT. In contrast to the results coming from the endocardial mapping where no preceding of the local ventricular activity (LVA) compared to onset QRS-complex was achieved (pacemap), epicardial mapping resulted in an identical pacemap in both pts. In one of the